

Missouri and upper Mississippi valleys, on the northeastern slope of the Rocky Mountains, in the northern plateau region, and along the north Pacific coast the maximum temperature was as high or higher than reported for April of preceding years; and at stations on the eastern slope of the Rocky Mountains, in the southern and northern plateau regions, and on the north Pacific coast the minimum temperature was as low or lower than previously reported for April.

In New Jersey the peach crop was damaged by cold on the 1st, 2d, 19th, and 20th. On the 20th frost damaged young fruit trees and killed tender plants in Virginia. On the 11th and 21st frost injured crops, vegetables, and fruit in South Carolina. On the 10th light frost damaged tender plants at Little Rock, Ark. On the 11th and 12th frost injured the peach crop in Oregon. On the 12th and 13th buds of raisin vines in the neighborhood of Fresno, Cal., were killed by cold.

The heaviest monthly precipitation reported was 16.85, at Columbia, La., and the rainfall exceeded ten inches in areas in the west Gulf states and in Siskiyou county, Cal. In areas in southwestern Arizona, southern California, southwestern Idaho, northeastern Montana, western Nevada, extreme western Texas, and central Utah no precipitation was reported. The precipitation was in excess of the average for the month at several stations on the south New England and middle Atlantic coasts, in the west Gulf states and thence northwestward over southern Missouri, the northern part of the Ohio Valley, and the eastern part of the upper lake region, along the eastern slope of the Rocky Mountains south of the forty-fifth parallel, in southeastern Arizona, and on the extreme north Pacific coast; elsewhere the precipitation was deficient. The greatest excess in precipitation occurred in south-central Indian Territory and thence southward to central Texas, and in south-central

Louisiana, where it was more than six inches, and the most marked deficiency was noted in central Alabama, where it was more than four inches. In the Rio Grande Valley and over the southeastern slope of the Rocky Mountains more than three times the usual amount of rain fell; over the southern plateau region nearly double the usual amount; and in the west Gulf states the precipitation was about one-half greater than the average for April. On the south Pacific coast the monthly precipitation was one-tenth, over the northern plateau region about one-fourth, and in the south Atlantic and east Gulf states, the extreme northwest, the middle plateau region, and the middle Pacific coast about one-half the usual amount for April. The rainfall for the month was the heaviest ever noted for April during the respective periods of observation at stations in Louisiana, Texas, Ohio, Indiana, Wyoming, Colorado, Indian Territory, New Mexico, and Arizona, and was the least ever reported for April at stations in Minnesota, South Dakota, Montana, southern California, and eastern Washington.

On the 8th destructive local storms occurred in Illinois, Ohio, Iowa, and Michigan; well-defined tornadoes occurred in Huron, Medina, and Summit counties, Ohio; wind storms prevailed from the upper Mississippi river to the Rocky Mountains; and heavy gales were reported on the lower lakes. On the 9th severe storms swept over portions of Virginia, western Pennsylvania, the south Atlantic and east Gulf states, and the Lake region. Reports of the 24th to 26th state that large tracts of country from central Texas into Indian Territory were under water as the result of excessively heavy rains. Destructive hail storms were reported at Roberts and Prophetstown, Ill., on the 8th; in the northern part of Champaign county, Ill., on the 13th; at Abilene, Tex., on the 24th; at Memphis, Tenn., on the 26th; and at Baltimore, Md., on the 27th.

## ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for April, 1890, as determined from observations taken daily at 8 a. m. and 8 p. m. (75th meridian time), is shown on chart ii by isobars. The departure of the mean pressure for April, 1890, obtained from observations taken twice daily at the hours named from that determined from hourly observations, varied at the stations named below, as follows:

| Station.              | Departure. | Station.                  | Departure. |
|-----------------------|------------|---------------------------|------------|
| Eastport, Me.....     | + .013     | Saint Louis, Mo.....      | + .001     |
| Boston, Mass.....     | + .013     | New Orleans, La.....      | + .002     |
| New York City.....    | + .010     | Saint Paul, Minn.....     | + .002     |
| Philadelphia, Pa..... | + .010     | Galveston, Tex.....       | + .003     |
| Washington City.....  | + .006     | Dodge City, Kans.....     | + .013     |
| Savannah, Ga.....     | + .004     | Santa Fe, N. Mex.....     | + .013     |
| Buffalo, N. Y.....    | + .005     | Denver, Colo.....         | + .010     |
| Detroit, Mich.....    | + .002     | Salt Lake City, Utah..... | + .009     |
| Cincinnati, Ohio..... | + .001     | Portland, Oregon.....     | + .015     |
| Memphis, Tenn.....    | + .004     | San Francisco, Cal.....   | + .015     |
| Chicago, Ill.....     | + .005     | San Diego, Cal.....       | + .016     |

For April, 1890, the mean pressure was highest from Virginia southward over the south Atlantic states, Georgia, and the Florida Peninsula, where it was above 30.15, the highest mean reading, 30.18, being noted at Augusta and Savannah, Ga., and Titusville, Fla., respectively. The mean pressure was above 30.10 from the Lake region southward over the east Gulf states, and along the immediate Pacific coast north of the fortieth parallel. The mean pressure was lowest over the southwestern and western parts of the southern plateau region, where it fell to or below 29.90, the lowest mean value reported being 29.89, at Keeler, Cal. The mean pressure was below 29.95 over the Gulf of Saint Lawrence, and fell to or below 30.00 over a greater part of the plateau region south of the fortieth parallel, and in central Montana.

A comparison of the pressure chart for April with that of the

preceding month shows that there has been an increase in mean pressure east of the Mississippi River, and from the north Pacific coast eastward over the northern Rocky Mountain regions and thence southeastward to the west Gulf coast; elsewhere the mean pressure was lower than for March. The relative positions of the areas of highest and lowest mean pressure remained about the same, the pressure for each month being highest over the southeastern states and on the Pacific coast, and lowest over the Gulf of Saint Lawrence and the southern plateau region.

The mean pressure was above the normal over the entire country, save at Yuma, Ariz., and Calgary, N. W. T., where it was .01 and .02, respectively, below the normal. The greatest departures above the normal pressure were noted at stations along the Atlantic coast from New Hampshire to Georgia, and along the east shore of Lake Huron, where they equalled or exceeded .15, whence they decreased westward and northwestward to less than .05 on the Pacific coast and over the northern Rocky Mountain region.

## BAROMETRIC RANGES.

The monthly barometric ranges at the several Signal Service stations are shown in the table of miscellaneous meteorological data. The general rule, to which the monthly barometric ranges over the United States are found to conform, is that they increase with the latitude and decrease slightly, though somewhat irregularly, with increasing longitude. In April, 1890, the monthly ranges were greatest in central and eastern New York, lower Michigan, and extreme northwestern Minnesota, where they equalled or exceeded 1.20, whence they decreased eastward to less than 1.00 over eastern Maine, southward to less than .40 over extreme southern Florida and the middle Gulf coast, southwest to less than .30 on the coast of southern California, and westward to less than .80 in the valley of the Columbia River. Along the Atlantic coast the

monthly ranges varied from .31 at Key West, Fla., to 1.21 at Albany, N. Y.; between the eighty-second and ninety-second meridians, .38 at New Orleans, La., to 1.26 at Lansing, Mich.; between the Mississippi River and the Rocky Mountains, .37 at Galveston, Tex., to 1.20 at Saint Vincent, Minn.; in the Rocky Mountain and plateau regions, .37 at Yuma, Ariz., to .91 at Boise City, Idaho; on the Pacific coast, .30 at Los Angeles and San Diego, Cal., to .91 at Port Angeles, Wash.

#### AREAS OF HIGH PRESSURE.

Six areas of high pressure were observed during the month of April, all of which reached the Atlantic or Gulf coasts. Four of these areas were first observed on the Pacific coast, and these, with one exception, were traced to the east of the Rocky Mountains north of the fiftieth parallel, the direction of movement to the west of the Rocky Mountains being slightly to the north of east, while the direction of movement east of the Rocky Mountains was generally to the south of east. Five of the areas of high pressure traced passed over the upper lake region, with one exception moving slightly to the south of east, while one area passing over that region moved directly from the Hudson Bay region to the south Atlantic coast. Although the number of areas of high pressure observed during April was less than the number traced during the preceding month they were more frequent on the Atlantic coast south of New York, five of the areas traced leaving the coast line between Cape May, N. J., and Jacksonville, Fla.

The following is a general description of the weather conditions attending each area of high pressure over the field of observation:

I.—The month opened with this area of high pressure central over Wisconsin, and it will be seen from the preceding REVIEW that it had its origin to the north of Montana on the 28th of March, its movement being retarded in that region until the close of the month, when it moved rapidly in a southeasterly direction, passing over the Lake region during the 1st, and including within its limits almost the entire country east of the Rocky Mountains. This progressive movement was attended by increasing pressure, the maximum readings of the barometer being observed on the middle Atlantic coast, when the centre was passing over that section on the morning of the 2d. It disappeared rapidly to the southeastward during the 2d and 3d, in advance of a storm which developed in the southwest.

II.—Appeared on the Pacific coast to the west of California on the 2d, and although not clearly defined, its movement can be traced northeastward from the telegraphic reports, the centre of greatest pressure being to the north of western Montana on the morning of the 3d and over Manitoba on the 4th. During its passage to the eastward of the Rocky Mountains, it extended southward over the eastern slope to Texas, although the centre of greatest pressure remained in high latitudes. It pursued a southeasterly course from Lake Superior to the south Atlantic coast, off which it was last observed on the 7th. As in the previous case the barometric pressure increased with the southeasterly movement of the area, the maximum pressure being observed when the centre of this area was passing over the Alleghanies. The barometric pressure was not so great as in the preceding case, and, although well defined, this area was less in extent and intensity than high area number i.

III.—First observed on the Pacific coast, and well to the southward, on the 7th. It moved to the north, following the coast line, the centre remaining to the westward, while the isobars bounding this area extended over the plateau regions, and on the morning of the 8th included the entire country from the Rocky Mountain regions westward to the Pacific coast, when the centre of greatest pressure was over western Oregon. At this point the northerly movement was interrupted, and during the 9th the area passed southeastward over the central plateau region, where it remained until the morning of the 10th, while a secondary area formed to the east of the Rocky Mountains and passed southeastward to the west Gulf coast, it being preceded by northerly gales, causing no

decided change in temperature, and attended by generally fair weather, only light showers occurring near the coast. The 8 p. m. telegraphic report of the 10th shows that this area of high pressure disappeared from the plateau region during that day, the barometric pressure declining .04 of an inch over Utah in twelve hours. Succeeding reports show, however, that the secondary area continued to move eastward, passing over the Gulf and south Atlantic states during the 11th and 12th attended by increasing pressure, the maximum being observed on the south Atlantic coast when the centre of greatest pressure was near to, and to the east of, the coast line. The pressure remained high over the south Atlantic states until the 13th, although it was decreasing slowly from the effects of an area of low pressure which was moving slowly eastward from the central Rocky Mountain region.

IV.—This area of high pressure appeared off the north Pacific coast on the 11th, immediately after the disappearance of that which covered the central plateau region on the 10th. It remained central near the Oregon coast during the 12th, after which it passed slightly to the north of east, and by the morning of the 13th its influence was felt as far to the eastward as Lake Superior. Telegraphic reports indicate that it probably received some re-enforcement from the region north of the stations of observation. On the morning of the 14th it was central over northern Minnesota, and apparently extended from the Saint Lawrence Valley westward to the Pacific coast. The centre moved eastward over the Lake region to Lake Huron, where it was located on the morning of the 15th, when the maximum pressure, 30.64, was observed at Saugeen, Ont. At this report the area of high pressure was elongated in an east and west direction, and extended from the Atlantic coast, north of Hatteras, N. C., westward to the Pacific. As it passed eastward from Lake Huron the direction changed to the southeast, and it passed over the middle Atlantic states on the 16th and 17th, and disappeared while central near the middle Atlantic coast on the 17th, apparently from a gradual decrease of pressure.

V.—The preceding area of high pressure was followed by the advance of this area from the Hudson Bay region over Lake Superior during the 17th. It moved slowly southward over the Lake region from the 18th to the 20th, during which time the telegraphic reports indicated the presence of a secondary area of high pressure in the region north of Montana. The southerly movement continued after the 20th, the centre of greatest pressure being located over Virginia on the morning of the 21st, when the secondary area of high pressure, previously referred to, had apparently united with the principal, which at that time covered the entire country east of the Rocky Mountains. On the morning of the 22d the states east of the Mississippi continued within the limits of this condition, the pressure being greatest over South Carolina, and on the 23d the states on the Atlantic coast still remained within its limits, the centre being to the south of Cape Hatteras, N. C. Reports received from the south Atlantic coast as late as the 25th indicated the presence of this area east of Florida.

VI.—First observed off the north Pacific coast on the 22d; it moved rapidly eastward to the northern Rocky Mountain regions on the 23d and to northern Minnesota on the 24th, when it extended from the Saint Lawrence Valley to the Pacific coast. On the morning of the 25th the barometric pressure had decreased within the limits of this area, which at that time was central over the upper lake region, while the telegraphic reports indicated that a secondary area had developed on the east slope of the Rocky Mountains to the north of Manitoba. The principal area of high pressure moved directly eastward over the Saint Lawrence Valley, and disappeared to the eastward of Nova Scotia on the 27th, while the secondary was apparently drawn southward by a storm which developed in Texas and moved northeastward over the Mississippi Valley and the lower lake region. It was central over Kansas on the afternoon of the 26th, over northern Texas on the morning of the 28th, and near the mouth of the Rio Grande River on the

29th, after which it was not sufficiently well-defined to be traced as an area of high pressure.

#### AREAS OF LOW PRESSURE.

Nine areas of low pressure were observed during the month, which is slightly less than the usual number observed during April. It will be seen from the preceding REVIEW that there has been a decided reduction in the number of areas of low pressure observed during the month of April as compared with those observed during the month of March. These disturbances usually originated in the region north of Montana, and after moving southeastward to the Lake region they changed course to the northeast, following the Saint Lawrence Valley. All the disturbances observed passed eastward over the meridian of the Mississippi Valley, and only one reached the Atlantic coast south of New York. They were most frequent over the upper lake region, eight of the depressions observed having been traced over this section, and in comparing chart number i with the same chart of the preceding REVIEW, it will be seen that the areas of low pressure during the month of April are slightly to the north of those observed during March.

The following is a general description of the weather conditions attending the movements of each barometric depression observed during the month and traced from the regular telegraphic reports of the Signal Service:

**I.**—The month opened with areas of low pressure covering the southern plateau region and the region north of Washington and Montana, while the eastern portion of the United States was within the limits of an extended area of high pressure. On the morning of the 2d the barometric trough attending the areas of low pressure referred to covered the entire Rocky Mountain regions, the areas of low pressure remaining in the extremities of this trough, one central over Texas and the other over Montana. These disturbances approached each other and united, forming a well-defined barometric depression, central in the lower Missouri valley on the morning of the 3d, after which the movement was to the eastward over the Lake region and Saint Lawrence Valley, the course being apparently a continuation of the course of the more southerly disturbance. This storm increased in intensity as it passed eastward, and its maximum energy was developed after passing to the east of New England, and when central in the vicinity of Sydney, C. B. I., where it was located on the morning of the 5th. It was followed by strong gales on the Atlantic coast as far south as Hatteras, N. C., the high winds continuing until the morning of the 5th, after the storm centre had passed far to the east of Newfoundland.

**II.**—Was first located as central over Colorado as a feeble disturbance on the 5th. It moved slowly eastward to the central Missouri valley on the 6th, after which it extended eastward; a secondary disturbance developed over the upper lake region and moved eastward over the lower lake region to the Saint Lawrence Valley during the 7th, while the principal disturbance could be no longer traced on the weather charts, its disappearance being due to the rapid advance of low area traced as number iii, which at that time was passing eastward north of Montana.

**III.**—This storm probably developed over the Pacific to the west of the state of Washington, where it was central on the 5th. It passed over British Columbia on the 6th, crossed the Rocky Mountains to the north of Montana on the night of the 6th, and reached Manitoba on the afternoon of the 7th. Although this disturbance was central to the north of Manitoba, its influence was felt as far south as central Texas, and from the Lake region westward to the Rocky Mountains. High southerly winds occurred over the eastern slope and in the upper Mississippi valley on the 7th, and these were followed by still stronger northwesterly winds on the 8th after the centre of disturbance had passed to the east of the Mississippi. The direction of movement changed from east to southeast when the centre reached the one-hundredth merid-

ian. On the morning of the 8th this depression was central over the southern portion of Lake Michigan, and it included within its limits the country from the Atlantic coast westward to the Rocky Mountains. The precipitation attending this disturbance was not excessive, except in a few localities in the Lake region and the upper Ohio valley. The southeasterly course continued until the afternoon of the 8th, when the lowest isobar bounding this disturbance included the states north of the Ohio River, the centre being located near Indianapolis, Ind. After this telegraphic report the direction of movement changed to the northeast, and the disturbance passed down the Saint Lawrence Valley with increasing energy, the minimum pressure, 29.16, being observed at Rockliffe, Ont., on the afternoon of the 9th, when the centre was near that point, and when easterly gales were reported in the Saint Lawrence Valley and on the New England and middle Atlantic coasts, and strong westerly gales were reported from the Lake region. The barometric pressure increased at the centre of this disturbance after the 9th as it passed northeastward over the Gulf of Saint Lawrence.

**IV.**—When the preceding disturbance was passing to the eastward over the Saint Lawrence Valley, the disturbance traced as number iv was approaching from the region north of Montana. It moved eastward to Manitoba, where it was central on the afternoon of the 10th, after which it moved directly southward to the Missouri Valley, assuming the shape of an elongated barometric trough, first extending east and west, and afterwards to the northeast and southwest over the eastern slope of the Rocky Mountains, and on the morning of the 12th two depressions were observed, one central over Wisconsin and the other over southern Kansas. The more easterly of these disturbances passed over the Lake region and disappeared, while that over Kansas moved westward to Colorado, after which the easterly course was resumed, the depression apparently skirting the southeastern quadrant of an advancing area of high pressure, but without developing any marked energy during its transit over the eastern portion of the United States, although the wind reached a maximum velocity of 40 miles at Boston, Mass., and 44 miles at Sandy Hook, N. J., but these winds were chiefly due to the advance of the attending area of high pressure. It disappeared to the east of Nova Scotia on the 15th, when northwesterly gales, attended by snow, were reported from the lower Saint Lawrence valley.

**V.**—Although the storm track on chart number i representing the course of this area gives the origin of this storm in northern Louisiana on the afternoon of the 16th, previous to that date, and as early as the 13th, a depression covered the southern plateau region and the Rio Grande Valley and remained in that section, gradually extending over the lower Rio Grande valley, until the 16th, when this depression formed over the lower Mississippi valley. This disturbance extended northward towards the Lake region, covering the Southern States and the Ohio Valley as a rain area, and passed off the middle Atlantic coast during the 18th, unattended by any marked atmospheric disturbance.

**VI.**—This disturbance was observed on the 16th, and was located in the northern extremity of the barometric trough within which the preceding area of low pressure developed. It moved southward from the Saskatchewan Valley to the upper Missouri valley where it was central on the 18th, after which it extended over the entire Rocky Mountain region, moving southward to New Mexico, where, on the 19th, a secondary disturbance developed to the southward over the Rio Grande Valley, while the principal area apparently moved to the central plateau region where it was located on the morning of the 20th, when areas of high pressure covered the country to the east and north of that region. After this date this disturbance followed the usual northeasterly course, reaching the upper Mississippi valley on the morning of the 22d, and the region north of Lake Superior on the morning of the 23d, and disappearing to the east of the Maritime Provinces on the 24th, when very severe northwesterly gales were reported from the

Gulf of Saint Lawrence, the current velocity at 8 a. m. of the 24th being sixty-eight miles per hour.

VII.—As in the case of low area number v, the development of this disturbance over Arkansas and the southwest was preceded by continued low pressure over the Rio Grande Valley during the preceding forty-eight hours, but the storm track of this disturbance, as given on chart number i, starts with the first clearly defined cyclonic movement of winds, and barometric depression with progressive movement, observed upon the weather chart. This storm apparently owes its origin to the advance of an area of high pressure southward over the eastern slope of the Rocky Mountains, the cold air moving to the westward of the barometric trough which extended over the lower Mississippi valley on the 25th was attended by northerly winds over Kansas and Texas, while warm southerly winds prevailed over the Southern States, and these conditions were followed by a rapid development of this storm, which passed over the Ohio Valley, the middle Atlantic states, and the north New England coast, where it was central on the morning of the 27th. During the transit of this storm rains prevailed generally throughout the country east of the Rocky Mountains, except in the Northwest, which continued generally under the influence of the area of high pressure. The rainfall

was especially heavy in the central Mississippi and Ohio valleys and the lower lake region.

VIII and IX.—This storm appeared in the region north of Montana on the 26th, when the preceding storm was passing eastward over the upper Ohio valley. It moved southeastward over the upper Missouri valley on the 27th, followed by high northwesterly winds in the Dakotas, and reached the upper lake region on the afternoon of the 28th, where its course changed to the eastward. The 8 a. m. weather chart of the 29th exhibits this as a well-defined depression central over Lake Huron, bounded by the isobars of 29.80, 29.90, and 30.00. The succeeding report of this day shows a northeasterly movement of this depression with an apparent decrease of energy, and its centre could not be located after the afternoon report of this date, probably owing to the advance of low area number ix which passed rapidly from the region north of Montana to Lake Superior during the night of the 28–29th. The presence of low area number ix in the vicinity of Lake Superior when the preceding one covered the Saint Lawrence Valley, caused a decrease of barometric gradient between these disturbances, which resulted in their uniting north of the Lake region, and at the close of the month low area number ix covered the upper Saint Lawrence valley.

Tabulated statement showing principal characteristics of areas of high and low pressure.

| Barometer.         | First observed. |         |          | Last observed. |          |     | Duration. | Velocity per hour. | Maximum abnormal changes in pressure in twelve hours, with maximum abnormal changes in temperature and maximum wind velocities in connection therewith. |                             |       |       |                             |       |                 |            |                               |       |
|--------------------|-----------------|---------|----------|----------------|----------|-----|-----------|--------------------|---|-----------------------------|-------|-------|-----------------------------|-------|-----------------|------------|-------------------------------|-------|
|                    | Date.           | Lat. N. | Long. W. | Lat. N.        | Long. W. |     |           |                    | Rise.   | Station.                    | Date. | Fall. | Station.                    | Date. | Miles per hour. | Direction. | Station.                      | Date. |
| <b>High areas.</b> |                 |         |          |                |          |     |           |                    |   |                             |       |       |                             |       |                 |            |                               |       |
| I.....             | *28             | 54      | 117      | 37             | 72       | 6.0 | 20        | .36                |   | Denver, Colo.....           | *31   | 31    | Palestine, Tex.....         | *31   | 42              | nw.        | Bismarck, N. Dak.....         | *28   |
| II.....            | 2               | 44      | 128      | 30             | 77       | 4.5 | 36        | .56                |   | Pittsburgh, Pa.....         | 5     | 20    | Duluth, Minn.....           | 3     | 52              | n.         | Sandy Hook, N. J.....         | 5     |
| III.....           | 7               | 37      | 126      | 32             | 77       | 5.0 | 37        | .72                |   | Swift Current, N. W. T..... | 8     | 26    | Cincinnati, Ohio.....       | 9     | 60              | sw.        | Winnemucca, Nev.....          | 7     |
| IV.....            | 10              | 46      | 130      | 40             | 75       | 6.5 | 22        | .72                |   | Fort Sully, S. Dak.....     | 12    | 42    | Calgary, N. W. T.....       | 10    | 52              | ne.        | Rapid City, S. Dak.....       | 8     |
| V.....             | 17              | 55      | 89       | 30             | 75       | 6.5 | 13        | .48                |   | Swift Current, N. W. T..... | 18    | 39    | Qu'Appelle, N. W. T.....    | 18    | 44              | s.         | Moorhead, Minn.....           | 19    |
| VI.....            | 22              | 48      | 130      | 48             | 56       | 5.0 | 33        | .54                |   | Port Arthur, Ont.....       | 23    | 28    | Saint Vincent, Minn.....    | 22    | 48              | ne.        | Block Island, R. I.....       | 25    |
| VIa.....           | 25              | 53      | 103      | 25             | 97       | 4.0 | 24        | .32                |   | Qu'Appelle, N. W. T.....    | 25    | 25    | Abilene, Tex.....           | 24    | 48              | n.         | Abilene, Tex.....             | 25    |
| Mean.....          |                 | 48      | 118      | 35             | 76       | 5.4 | 26        | .53                |   |                             |       | 30    |                             |       | 49              |            |                               |       |
| <b>Low areas.</b>  |                 |         |          |                |          |     |           |                    |   |                             |       |       |                             |       |                 |            |                               |       |
| I.....             | 2               | 32      | 97       | 43             | 59       | 3.0 | 40        | .42                |   | Des Moines, Iowa.....       | 3     | 20    | Palestine, Tex.....         | 2     | 48              | s.         | Springfield, Ill.....         | 3     |
| Ia.....            | 1               | 52      | 117      | 41             | 95       | 2.0 | 33        | .38                |   | Minnedosa, Man.....         | 1     | 17    | Minnedosa, Man.....         | 1     | 36              | sw.        | Saint Louis, Mo.....          | 1     |
| II.....            | 5               | 43      | 106      | 49             | 53       | 3.0 | 40        | .46                |   | Port Arthur, Ont.....       | 5     | 21    | Cleveland, Ohio.....        | 6     | 42              | nw.        | Fort Assiniboine, Mont.       | 7     |
| III.....           | 5               | 48      | 128      | 52             | 62       | 5.0 | 35        | .54                |   | Calgary, N. W. T.....       | 6     | 17    | Swift Current, N. W. T..... | 6     | 52              | w.         | Sandy Hook, N. J.....         | 7     |
| IV.....            | 9               | 56      | 115      | 48             | 68       | 5.0 | 33        | .50                |   | Calgary, N. W. T.....       | 9     | 25    | Milwaukee, Wis.....         | 8     | 52              | sw.        | Columbus, Ohio.....           | 9     |
| V.....             | 16              | 33      | 93       | 39             | 71       | 1.5 | 41        | .30                |   | Norfolk, Va.....            | 17    | 13    | Moorhead, Minn.....         | 10    | 64              | w.         | Buffalo, N. Y.....            | 9     |
| VI.....            | 16              | 55      | 117      | 52             | 69       | 7.5 | 24        | .30                |   | Calgary, N. W. T.....       | 20    | 21    | Atlanta, Ga.....            | 18    | 40              | nw.        | Fort Assiniboine, Mont.       | 10    |
| VII.....           | 26              | 37      | 90       | 48             | 57       | 2.0 | 44        | .40                |   | Port Arthur, Ont.....       | 22    | 21    | Helena, Mont.....           | 16    | 68              | nw.        | Sandy Hook, N. J.....         | 18    |
| VIII.....          | 26              | 53      | 117      | 46             | 76       | 2.0 | 34        | .40                |   | Portland, Me.....           | 27    | 21    | Abilene, Tex.....           | 25    | 42              | se.        | Anticosti Island, G. of S. L. | 24    |
| IX.....            | 28              | 55      | 118      | 47             | 75       | 2.0 | 48        | .44                |   | Milwaukee, Wis.....         | 28    | 17    | Qu'Appelle, N. W. T.....    | 25    | 44              | nw.        | Corpus Christi, Tex.....      | 25    |
|                    |                 |         |          |                |          |     |           |                    |   | Calgary, N. W. T.....       | 28    | 23    | Swift Current, N. W. T..... | 26    | 42              | sw.        | Fort Buford, N. Dak.....      | 27    |
|                    |                 |         |          |                |          |     |           |                    |   | Duluth, Minn.....           | 29    | 23    |                             | 28    | 46              |            | Chicago, Ill.....             | 30    |
| Mean.....          |                 | 46      | 110      | 46             | 68       | 3.3 | 37        | .41                |   |                             |       | 20    |                             |       | 48              |            |                               |       |

\* March.

## ○ NORTH ATLANTIC STORMS FOR APRIL, 1890 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during April, 1890, are shown on chart i. These paths have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Twelve depressions have been traced for April, 1890, the average number traced for the corresponding month of the last seven years being nine. The greatest number of depressions previously traced for April was thirteen, in 1886, and the least number was six, in 1883. Of the depressions traced for the current month, four were continuations of areas of low

pressure which first appeared over the North American continent; one was a continuation of depression number 10 for March, and was the storm traced and described as low area xi, within whose area the destructive tornadoes of March 27th occurred in the Ohio and middle Mississippi valleys; two apparently developed southeast of the Grand Banks; one first appeared south of Nova Scotia; two were first located west or southwest of the British Isles; and one advanced over mid-ocean in high latitudes. The depressions which advanced from the western Atlantic passed north of the region of observation before reaching the British Isles, and no storm-centres were located south of the thirty-fifth parallel.

The movements of areas of high pressure during the month were as follows: on the 2d an area of high pressure occupied